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[Claim(s)]

[Claim 1]A heat chemicals gaseous phase evaporation apparatus comprising:
A belt which rotates two or more substrates being laid one by one.
A rotary part which rotates said belt.
The base of pallet which lays said substrate one by one on said belt.
An exhausting section which collects substrates which were countered and installed in said base of pallet, and moved by rotation of said belt, A reactant gas feed section which supplies reactant gas for making a carbon nanotube compound on a substrate which moves along with said belt, a substrate-heating part which heats a substrate laid on said belt for a thermal reaction of said reactant gas, and an exhaust air part which exhausts said reactant gas.

[Claim 2]The heat chemicals gaseous phase evaporation apparatus comprising according to claim 1:
The 1st reactant gas feed section which supplies the 1st reactant gas to a substrate by which said reactant gas feed section was laid on said belt.
The 2nd reactant gas feed section which supplies the 2nd reactant gas after said 1st reactant gas reacts on a substrate which is provided after said 1st reactant gas feed section, and moves by rotation of said belt.

[Claim 3]Said substrate-heating part heats a field of said belt which counters said 1st reactant gas feed section by about 700 to 1100 ** temperature conditions, The heat chemicals gaseous phase evaporation apparatus according to claim 2 heating a field of said belt which counters said 2nd reactant gas feed section by about 500 to 1100 ** temperature conditions.
[Claim 4]Said substrate including a transition metal film used for the surface as a catalyst, [said 1st reactant gas] Are said transition metal film ammonia gas etched to detailed grain,

and, [said 2nd reactant gas] The heat chemicals gaseous phase evaporation apparatus according to claim 2 being carbonization gas of either acetylene gas, methane, propane or ethylene, or being the gas which mixed ammonia gas or hydrogen gas in said carbonization gas.

[Claim 5]The heat chemicals gaseous phase evaporation apparatus according to claim 1, wherein said base of pallet and said exhausting section have a robot arm which takes said substrate and to which it is made to move.

[Claim 6]A heat chemicals gaseous phase evaporation apparatus comprising:

A belt which rotates two or more substrates being laid one by one.

A rotary part which rotates said belt.

The base of pallet which lays said substrate one by one on said belt.

An exhausting section which collects substrates which were countered and installed in said base of pallet, and moved by rotation of said belt, A reactant gas feed section which supplies reactant gas for making a carbon nanotube compound on a substrate which moves along with said belt, A reactant gas heating unit which heats reactant gas which is installed in the circumference of said reactant gas feed section, and passes said reactant gas feed section, a substrate-heating part which heats a substrate laid on said belt, and an exhaust air part which exhausts said reactant gas.

[Claim 7]The heat chemicals gaseous phase evaporation apparatus comprising according to claim 6:

The 1st reactant gas feed section which supplies the 1st reactant gas to a substrate by which said reactant gas feed section was laid on said belt.

The 2nd reactant gas feed section which supplies the 2nd reactant gas after said 1st reactant gas reacts on a substrate which is provided after said 1st reactant gas feed section, and moves by rotation of said belt.

[Claim 8]The heat chemicals gaseous phase evaporation apparatus comprising according to claim 7:

The 1st reactant gas heating unit by which said reactant gas heating unit is installed in the circumference of said 1st reactant gas feed section.

The 2nd reactant gas heating unit installed in the circumference of said 2nd reactant gas feed section.

[Claim 9]By 700 to 1100 ** temperature conditions, heat said 1st reactant gas heating unit, and the 1st reactant gas that passes said 1st reactant gas feed section, [said 2nd reactant gas heating unit] The heat chemicals gaseous phase evaporation apparatus according to claim 8,

wherein it heats the 2nd reactant gas that passes said 2nd reactant gas feed section by 500 to 1100 ** temperature conditions and said substrate-heating part heats a substrate on said belt by about 400 to 600 ** temperature conditions.
[Claim 10]Said substrate including a transition metal film used for the surface as a catalyst, [said 1st reactant gas] Are said transition metal film ammonia gas etched to detailed grain, and, [said 2nd reactant gas] The heat chemicals gaseous phase evaporation apparatus according to claim 7 being carbonization gas of either acetylene gas, methane, propane or ethylene, or being the gas which mixed ammonia gas or hydrogen gas in said carbonization gas.
[Claim 11]A synthesizing method of a carbon nanotube characterized by comprising the following.
A stage of laying two or more substrates one by one by the base of pallet on a rotating belt.
A stage which rotates said belt and to which said laid substrate is moved one by one by a rotary part.
A stage of heating a substrate laid on said belt by a heating unit, supplying reactant gas from a reactant gas feed section on said substrate which moves, and making a carbon nanotube compounding on said substrate which moves.
A stage of collecting substrates by which said carbon nanotube was compounded one by one by an exhausting section which counters said base of pallet and is installed.

[Claim 12]A synthesizing method of the carbon nanotube according to claim 11 including further a stage which forms a transition metal film used as a catalyst on said substrate.
[Claim 13]Said transition metal film Cobalt, nickel, iron, yttrium, a cobalt nickel alloy, A synthesizing method of the carbon nanotube according to claim 12 consisting of either a cobalt iron alloy, a nickel iron alloy, a cobalt nickel iron alloy, a cobalt nickel yttrium alloy or a cobalt yttrium alloy.
[Claim 14]A synthesizing method of the carbon nanotube according to claim 12 characterized by comprising the following.
A stage which a stage which compounds said carbon nanotube supplies the 1st reactant gas through the 1st reactant gas feed section of said reactant gas feed section on said substrate which moves, and etches said transition metal film to detailed grain.
A stage which supplies the 2nd reactant gas that is carbonization gas for composition of said carbon nanotube through the 2nd reactant gas feed section of said reactant gas feed section on a substrate which moves by rotation of said belt after supply of said 1st reactant gas.

[Claim 15]Said 1st reactant gas is ammonia gas, and, [said 2nd reactant gas] A synthesizing method of the carbon nanotube according to claim 14 which is carbonization gas of either

acetylene gas, methane, propane or ethylene, or is characterized by being the gas which mixed ammonia gas or hydrogen gas in said carbonization gas.
[Claim 16][a field on said belt in which said 1st reactant gas is supplied] A synthesizing method of the carbon nanotube according to claim 14, wherein it is heated by 700 to 1100 ** temperature conditions by said heating unit and a field on said belt in which said 2nd reactant gas is supplied is heated by 500 to 1100 ** temperature conditions by said heating unit.
[Claim 17]A synthesizing method of a carbon nanotube characterized by comprising the following.
A stage of laying two or more substrates one by one by the base of pallet on a rotating belt.
A stage which rotates said belt and to which said laid substrate is moved one by one by a rotary part.
A stage of supplying reactant gas which heated a substrate laid on said belt by a heating unit, and was heated passing said reactant gas feed section by a reactant gas heating unit installed in the circumference of a reactant gas feed section on said substrate which moves, and making a carbon nanotube compounding on said substrate which moves.
A stage of collecting substrates by which said carbon nanotube was compounded one by one by an exhausting section which counters said base of pallet and is installed.

[Claim 18]A synthesizing method of the carbon nanotube according to claim 17 including further a stage which forms a transition metal film used as a catalyst on said substrate.
[Claim 19]A synthesizing method of the carbon nanotube according to claim 18 characterized by comprising the following.
A stage which compounds said carbon nanotube supplies the 1st reactant gas heated by the 1st reactant gas heating unit of said reactant gas heating unit installed in the circumference of the 1st reactant gas feed section of said reactant gas feed section through said 1st reactant gas feed section on said substrate which moves, A stage which etches said transition metal film to detailed grain.
After supply of said 1st reactant gas, With the 2nd reactant gas heating unit of said reactant gas heating unit installed in the circumference of the 2nd reactant gas feed section of said reactant gas feed section. A stage which supplies the 2nd reactant gas that is carbonization gas for composition of said heated carbon nanotube through said 2nd reactant gas feed section on a substrate which moves by rotation of said belt.

[Claim 20]By 700 to 1100 ** temperature conditions, heat said 1st reactant gas heating unit, and the 1st reactant gas that passes said 1st reactant gas feed section, [said 2nd reactant gas heating unit] A synthesizing method of the carbon nanotube according to claim 19, wherein it heats the 2nd reactant gas that passes said 2nd reactant gas feed section by 500 to 1100 **

temperature conditions and said heating unit heats a substrate on said belt by about 400 to 600 ** temperature conditions.

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the synthesizing method of the heat chemicals gaseous phase evaporation apparatus used for carrying out extensive composition of the carbon nanotube especially using a large area board, and the carbon nanotube using this about carbon nanotube (carbon nanotubes) composition.
[0002]
[Description of the Prior Art]Three carbon atoms in which a carbon nanotube adjoins one carbon atom microscopically are combined.
A hexagon annular next door and the shape of such a hexagon ring are known by combination between such carbon atoms as a thing of the shape of a nest of a bee which is cylindrical or makes the shape of a tube.
Generally, it is known that the diameter is tens of nm from several angstroms, and, as for said carbon nanotube, the length has the long characteristic in thousands or more times from tens times of a diameter. such a carbon nanotube is like metal by the structure -- electric -- the characteristic of a conductor (Armchair structure) is shown or the characteristic like a semiconductor (Zigzag structure) is shown. A carbon nanotube is divided into a single wall nanotube (single-wall nanotube), a multiplex wall nanotube (multi-wall nanotube), or a rope-like nanotube (rope nanotube) by the form. Such a carbon nanotube is excellent in an electrical property, mechanical strength is large, it is evaluated as a also chemically stable substance and the application is greatly expected by the electronic information field of industry.
[0003]The various methods related with such carbon nanotube synthesis these days are proposed, and various devices are shown in order to realize such a method. For example, an electric electric discharge device (arc discharge system), A laser deposition device (laser evaporationsystem), a heat chemicals gaseous phase evaporation apparatus (thermal chemical vapor deposition system), a plasma chemistry gaseous phase evaporation apparatus, etc. are shown. In this, after a heat chemicals gaseous phase evaporation apparatus mainly puts in a substrate in a quartz tube, it is used for making reactant gas react at high temperature, and compounding a carbon nanotube on a substrate.
[0004]
[Problem to be solved by the invention]There is the issue which this invention tends to solve in providing the heat chemicals gaseous phase evaporation apparatus used for compounding a

carbon nanotube continuously on many large area boards. There are other issues which this invention tends to solve in providing the method of compounding a carbon nanotube continuously on many large area boards using said heat chemicals gaseous phase evaporation apparatus.

[0005]

[Means for solving problem]The heat chemicals gaseous phase evaporation apparatus of this invention for solving said SUBJECT is provided with the following.

The belt which rotates many substrates being laid one by one.

The rotary part which rotates said belt.

The base of pallet which lays said substrate one by one on said belt.

The exhausting section which collects said substrates which were countered and installed in said base of pallet, and moved by rotation of said belt, The reactant gas feed section which supplies the reactant gas for making a carbon nanotube compound on said substrate which moves along with said belt, the substrate-heating part which heats said substrate laid on said belt for the thermal reaction of said reactant gas, and the exhaust air part which exhausts reactant gas.

[0006]Here, said reactant gas feed section is provided with the following.

The 1st reactant gas feed section which supplies the 1st reactant gas to said substrate laid on said belt.

The 2nd reactant gas feed section which supplies the 2nd reactant gas on said substrate which moves by rotation of said belt after it is provided after said 1st reactant gas feed section and said 1st reactant gas reacts.

Said substrate-heating part heats the field of said belt which counters said 1st reactant gas feed section by about 700 to 1100 ** temperature conditions, and heats the field of said belt which counters said 2nd reactant gas feed section by about 500 to 1100 ** temperature conditions.

[0007]Said substrate contains the transition metal film used for the surface as a catalyst, The 1st reactant gas is ammonia gas which etches said transition metal film to detailed grain, and said 2nd reactant gas is acetylene gas, methane, propane, or carbonization gas of ethylene, or is the gas which mixed ammonia gas or hydrogen gas in said carbonization gas.

[0008]This heat chemicals gaseous phase evaporation apparatus can contain the reactant gas heating unit which heats the reactant gas which is independently installed in the circumference of said reactant gas feed section, and passes said reactant gas feed section. In this case, the 1st reactant gas heating unit of said reactant gas heating unit is heated by 700 to 1100 ** temperature conditions, the 2nd reactant gas heating unit of said reactant gas heating unit is heated by 500 to 1100 ** temperature conditions, and said substrate-heating part can be

heated by about 400 to 600 ** temperature conditions.

[0009]

[Mode for carrying out the invention]Hereafter, based on attached Drawings, an embodiment of this invention is described in detail. However, the embodiment of this invention can change into other various forms, and must not be interpreted as what is limited by embodiment which the range of this invention mentions later. An embodiment of this invention is provided in order to explain this invention to a person skilled in the art still more completely. Therefore, shape of an element in Drawings is exaggerated in order to emphasize clearer explanation, and an element which expressed with the numerals same on Drawings means the same element.

[0010]Hereafter, in order to make this invention still more concrete, an embodiment of this invention which quotes Drawings and this is described. Drawing 1 is Drawings in which a heat chemicals gaseous phase evaporation apparatus is shown roughly, in order to explain a synthesizing method of a carbon nanotube using a heat chemicals gaseous phase evaporation apparatus and this by the 1st desirable embodiment of this invention.

[0011]If drawing 1 is referred to, a heat chemicals gaseous phase evaporation apparatus by the 1st embodiment of this invention contains the rotating belt 600 in which many substrates 100 of a large area were laid. the belt 600 -- many -- it may become a form where several large area plates were connected. It moves the laid substrate 100, such a belt 600 rotating in the fixed direction by the rotary part 650 like the axis of rotation connected with a motor.

[0012]The base of pallet 210 is installed near the end part of the belt 600. The robot arm 270 contained in the base of pallet 210 carries out the role which lays the substrate 100 one by one on the rotating belt 600. The exhausting section 250 is installed near the other end of the belt 600. The robot arm 270' contained in the exhausting section 250 carries out the role which collects the substrates 100 which were put on the belt 600 and moved one by one.

[0013]The reactant gas feed sections 450 and 460 which supply the reactant gas used for compounding a carbon nanotube on the substrate 100 which is carried on the belt 600 and moves from the base of pallet 210 are countered and formed on the substrate 100 which moves. The reactant gas feed sections 450 and 460 have shape, such as a nozzle, and carry out the role which supplies reactant gas on the substrate 100 which moves on the belt 600.

[0014]Number preparation **** which need the reactant gas feed sections 450 and 460 for composition of a carbon nanotube. For example, the 1st reactant gas feed section 450 is introduced into a front position, the 2nd reactant gas feed section 460 is introduced into a next position, and the 1st reactant gas container 310 is connected with the 1st reactant gas feed section 450, and the 2nd reactant gas container 350 is connected with the 2nd reactant gas feed section 460, and it sells to it. Thereby, the 1st reactant gas is supplied to the substrate 100 which moves on the belt 600, passing through the introductory field of said 1st reactant gas feed section 450, and the 2nd reactant gas is supplied to it, passing through the

introductory field of said 2nd reactant gas feed section 460. On the other hand, the substrate-heating part 700 which heats the field which adjoins the substrate 100 or the substrate 100 is introduced into the lower part of the belt 600 to which the substrate 100 is moved. Such a substrate-heating part 700 carries out the role which provides the temperature conditions to which the reactant gas supplied on the substrate 100 under movement can react on the substrate 100. Such a substrate-heating part 700 can be respectively heated by other temperature conditions according to the field of the belt 600. For example, in the field which counters the 1st reactant gas feed section 450, the substrate-heating part 700 is heated so that the temperature of about 700 to 1100 ** may be maintained. And in the field which counters the 2nd reactant gas feed section 460, the substrate-heating part 700 is heated so that the temperature of about 500 to 1100 ** may be maintained. Although such temperature conditions are mentioned later, it corresponds to the temperature range required to compound a carbon nanotube.

[0015]On the other hand, an exhaust port which exhausts reactant gas which was not exhausted although it is made to compound or grow up, but did the /remains of a carbon nanotube on the substrate 100 is provided in the lower berth of the belt 600, the fan 800 is formed in such an exhaust port, and an exhaust air operation can be aimed at. And such a belt 600 and the reactant gas feed sections 450 and 460 are altogether formed in the exterior cases 900, for example, a chamber, and such a chamber 900 is maintained at low pressure from normal pressure or normal pressure. However, the chamber 900 can be maintained by normal pressure on facilities of a process.

[0016]By explaining a synthesizing method of a carbon nanotube to the substrate 100 top explains still more concretely operation and a utilizing method of a heat chemicals gaseous phase evaporation apparatus by the 1st embodiment of this invention which was mentioned above. If drawing 1 is referred to again, the substrate 100 of a large area may contain a transition metal film (not shown) on the surface beforehand. Such a transition metal film is used as a catalyst in carbon nanotube synthesis. Therefore, a transition metal film consists of heat vapor deposition, sputtering, an ion-beam-deposition method, etc., and can be desirably formed in a thickness of about 3 to 50 nm about 200 nm from 3. Under the present circumstances, the transition metal film can consist of a transition metal like cobalt, nickel, iron, yttrium, a cobalt nickel alloy, a cobalt iron alloy, a nickel iron alloy, a cobalt nickel iron alloy, a cobalt nickel yttrium alloy, or a cobalt yttrium alloy.

[0017]On the other hand, the substrate 100 can consist of the various quality of the materials if needed. For example, it consists of glass, alumina, or silicon, and can be made a large area. Several many boards 100 prepared in this way are loaded into the base of pallet 210. By the robot arm 270 of the base of pallet 210, the prepared substrate 100 is carried one by one on the rotating belt 600. The substrate 100 moves by rotation of the belt 600.

[0018]On the other hand, the 1st reactant gas feed section 450 supplies ammonia gas prepared for the 1st reactant gas container 310 on the substrate 100 which passes along the lower part of the 1st reactant gas feed section 450. Such ammonia gas is introduced as gas for a chemical engraving of a transition metal film which exists on said substrate 100. Under the present circumstances, hydrogen gas may be supplied. A transition metal film is etched by detailed grain (fine grain) with ammonia gas supplied as mentioned above. Concretely, 1100 ** of substrates 100 passing through a lower field or such a field of the 1st reactant gas feed section 450 are desirably heated in [temperature] about 800 to 900 ** from 700 by the substrate-heating part 700 substantially introduced into the lower part of the belt 600. It will be activated or (activation) decomposed thermally (decomposition), and ammonia gas supplied on said field maintained at such temperature conditions or the substrate 100 will etch said transition metal film to detailed grain. Such ammonia gas can supply a flow about 80 to 1000SCCM (Standard Cubic Centimeters per Minute).
[0019]Therefore, the detailed grain of a transition metal will exist in the surface of the substrate 100 which passed through said 1st reactant gas feed section 450. If such a substrate 100 arrives at the field which counters the 2nd reactant gas feed section 460 by rotation of the belt 600, on the substrate 100, the 2nd reactant gas, for example, carbonization gas, will be supplied. Since the field which counters such a 2nd reactant gas feed section 460 is maintained by the substrate-heating part 700 by about 500 to 1100 ** temperature conditions, Such carbonization gas is decomposed, a carbon source is provided on the substrate 100, and a carbon source is compounded by the carbon nanotube on the detailed grain of a transition metal. Thereby, on the substrate 100, a carbon nanotube makes it perpendicular for **, and it is compounded, and grows up. The gas which can provide carbon like acetylene gas, methane, propane, or ethylene as said carbonization gas is used, and it can supply by the flow of about 20 to 1000 SCCM through said 2nd reactant gas feed section 460. Said 2nd reactant gas feed section 460 can be supplied at such carbonization gas, including ammonia gas or/and hydrogen gas further. Under the present circumstances, carbon gas: The mixture ratio of hydrogen gas or ammonia gas is about 1:1, and 1:2, 1:3 or 1:4.
[0020]The substrate 100 by which a carbon nanotube was compounded on the surface moves by rotation of the belt 600, and is recovered by the robot arm 270' of the adjoining exhausting section 250. A series of processes which were mentioned above become possible when the substrate 100 of a large area moves one by one by rotation of the belt 600. If a carbon nanotube is compounded using a heat chemicals gaseous phase evaporation apparatus by the 1st embodiment of this invention which was mentioned above, a carbon nanotube can be compounded one by one and continuously on the substrate 100 of many large areas. That is, extensive composition of the carbon nanotube which aligned perpendicularly on the substrate 100 in a short time extremely can be carried out.

[0021]Drawing 2 is Drawings in which a heat chemicals gaseous phase evaporation apparatus is shown roughly, in order to explain a synthesizing method of a carbon nanotube using a heat chemicals gaseous phase evaporation apparatus and this by the 2nd desirable embodiment of this invention. Hereafter, in explanation of the 2nd embodiment, the same member number as explanation of the 1st embodiment means the same member. If drawing 2 is referred to, a heat chemicals gaseous phase evaporation apparatus by the 2nd embodiment of this invention differs from a heat chemicals gaseous phase evaporation apparatus of the 1st embodiment of drawing 1, The 1st reactant gas heating unit 510 is introduced into the circumferences, such as the 1st reactant gas feed section 450, for example, a nozzle etc., the 2nd reactant gas heating unit 550 is respectively introduced into the circumference of the 2nd reactant gas feed section 460, and it gets. Whether such reactant gas heating units' 510 and 550 heating reactant gas which passes the reactant gas feed sections 450 and 460, and being activated, and a role to decompose are carried out.

[0022]The composition of the heat chemicals gaseous phase evaporation apparatus by the 2nd embodiment of such this invention, operation, a utilizing method, and the method of compounding a carbon nanotube on the substrate 100 by this are explained concretely. If drawing 2 is referred to again, several many boards 100 by which the transition metal film (not shown) was prepared for the surface like explanation of the 1st embodiment will be loaded into the base of pallet 210. Under the present circumstances, the substrate 100 of a large area can be constituted from glass or silicon, alumina, etc., as mentioned above, but let the case where the substrate 100 consists of glass be an example in the 2nd embodiment of this invention. When the substrate 100 of a large area consists of glass, the substrate 100 concerning forming FED (Field Emitting Device), VFD (Vacuum Fluorescence Display), or an element like a white light source is used. That is, since said substrate 100 consists of glass, it can apply to the known vacuum mounting process for said display and an element.

[0023]However, it is known that such a glass substrate 100 and especially the glass substrate 100 mainly used for a display have the low melting point at about 550 **, When it is heated by the substrate-heating part 700 at about 700 to 1100 ** like explanation of the 1st embodiment by this, the defect that substrate 100 the very thing will melt may occur. In the 2nd embodiment, in order to prevent this, the substrate-heating part 700 introduced under the belt 600 heats from 400 600 ** of substrates 100 which pass along the field or such a field on the belt 600 by about 500 to 550 ** temperature conditions desirably. Thereby, problems, like the glass substrate 100 melts during composition of a carbon nanotube can be solved.

[0024]However, for thermal disassembly of acetylene gas for offer of the ammonia gas used as chemical engraving gas as mentioned above, or a carbon source, etc., it is known that not less than about 700 ** temperature conditions are required. For this reason, in the 2nd embodiment, the reactant gas heating units 510 and 550 are introduced. That is, the 1st

reactant gas heating unit 510 heats desirably the 1st reactant gas that passes the 1st reactant gas feed section 450, for example, ammonia gas, and 1100 ** of hydrogen gas by about 800 to 900 ** temperature conditions from 700. Thereby, thermal decomposition of the ammonia gas is carried out, and these reacting species by which thermal decomposition was carried out are supplied on the substrate 100 which passes along the lower part of the 1st reactant gas feed section 450. Thermal decomposition of chemical engraving gas like the above-mentioned ammonia gas may be substantially generated within the 1st reactant gas feed section 450.
[0025]Thus, the ammonia gas by which thermal decomposition was carried out, i.e., reacting species, etches the transition metal film prepared on the substrate 100, and they form in the surface of the substrate 100 the detailed grain which acts as a catalyst. Thus, since the ammonia gas by which thermal decomposition was already carried out, i.e., reacting species, is substantially supplied on the substrate 100 even if the temperature conditions around the substrate 100 are kept substantial at about 550 ** by the substrate-heating part 700, the chemical engraving of a transition metal film which was mentioned above is performed.
[0026]Detailed grain moves the substrate 100 formed in the surface to a lower field of the 2nd reactant gas feed section 460 by movement of the belt 600. The 2nd reactant gas by which thermal decomposition was carried out, i.e., reacting species, is supplied on the substrate 100 through the 2nd reactant gas feed section 460. For this reason, the 2nd reactant gas heating unit 550 introduced into the circumference of the 2nd reactant gas feed section 460 heats the 2nd reactant gas that passes the 2nd reactant gas feed section 460, for example, carbonization gas like acetylene gas. Mixed gas which included ammonia gas or/and hydrogen gas in such carbonization gas further can be supplied through the 2nd reactant gas feed section 460.
[0027]Under the present circumstances, about 1100 ** of carbonization gas is desirably heated by about 900 ** temperature conditions from 500, and thermal decomposition is substantially carried out within said 2nd reactant gas feed section 460. Such carbonization gas can be supplied by a flow of about 20 to 1000 SCCM. Under the present circumstances, carbonization gas is mixed further and ammonia gas or/and hydrogen gas are sold to it. In this case, carbonization gas: The mixture ratio of ammonia gas (or hydrogen gas) is 1:1, 1:2, 1:3, or 1:4.
[0028]Acetylene gas by which thermal decomposition was carried out is compounded by carbon nanotube by a catalytic action of detailed grain of a transition metal formed on the substrate 100. Under the present circumstances, since the substrate 100 is kept substantial to temperature of about 500 to 550 ** by the substrate-heating part 700, a synthetic reaction of said carbon nanotube is fully performed. Henceforth, the substrate 100, as for, a carbon nanotube carried out synthetic growth moves with the belt 600, and is recovered by the robot arm 270' of the exhausting section 210.
[0029]A series of processes which were mentioned above become possible when the

substrate 100 of a large area moves one by one by rotation of the belt 600. If a carbon nanotube is compounded using a heat chemicals gaseous phase evaporation apparatus by the 2nd embodiment of this invention which was mentioned above, even if it does not impress high temperature, for example, about 700 ** high temperature, to the substrate 100 substantially, a carbon nanotube can be compounded one by one and continuously on the substrate 100 of many large areas. That is, extensive composition of the carbon nanotube which aligned in a short time extremely perpendicularly on the substrate 100 vulnerable with heat like glass of a low melting point can be carried out.

[0030]

[Effect of the Invention]Therefore, according to the synthesizing method of the heat chemicals gaseous phase evaporation apparatus of this invention, and the carbon nanotube using this, extensive composition of the carbon nanotube which aligned perpendicularly on a substrate in a short time extremely can be carried out.

[Brief Description of the Drawings]

[Drawing 1]It is a mimetic diagram showing the heat chemicals gaseous phase evaporation apparatus used for compounding the carbon nanotube by the 1st embodiment of this invention.

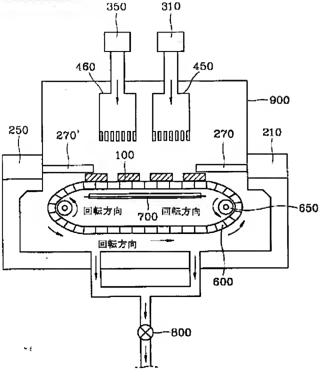
[Drawing 2]It is a mimetic diagram showing the heat chemicals gaseous phase evaporation apparatus used for compounding the carbon nanotube by the 2nd embodiment of this invention.

[Explanations of letters or numerals]

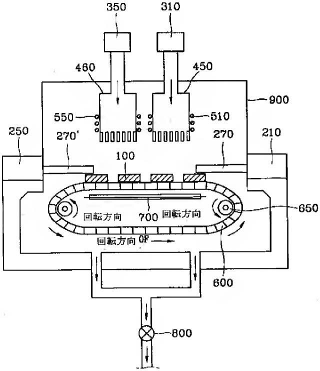
100 Substrate
210 Base of pallet
250 Exhausting section
270 and 270' robot arm
310 1st reactant gas container
350 2nd reactant gas container
450 1st reactant gas feed section
460 2nd reactant gas feed section
510 1st reactant gas heating unit
550 2nd reactant gas heating unit
600 Belt
700 Substrate-heating part
800 Fan

900 Chamber

[Drawing 1]



[Drawing 2]



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